TWO NEW TREE KANGAROOS FROM PAPUA, WITH NOTES ON ALLIED FORMS.

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The tree kangaroos of north-eastern Queensland, New Guinea, and several adjacent islands, are of remarkable interest within their family in having undergone an unusual twist or secondary phase of evolution which is reflected in their peculiar habits and appearance. Following upon the long period of entirely terrestrial existence in company with their fellows, which moulded a typical kangaroo-like appearance, the ancestral members of the genus *Dendrolagus* reverted to the trees again for food and shelter, with a corresponding reversal in general structure towards the arboreal type.

The secondary phase or readaptation is clearly shown in the re-acquired shortening and broadening of the hind feet, which have cushioned soles with serrations to prevent slipping, while the forepaws are very large and powerfully clawed for grasping branches, and the long tail has become slender and more possum-like, with a somewhat brushy tip, so that it acts as a rudder during long leaps or a prop when climbing.

Another result of readaptation to their favoured habitat is that the natural attitude of tree kangaroos has become more squatting or possum-like so that the back is almost horizontal, though the degree varies in several species. The variation in posture is indicated by the position of single or paired whorls at the point of reversal of the thick fur of the back, which acts as a natural rain-turning device adjusted to the carriage of the body. The situation of these "crowns" or whorls is generally regarded as of specific importance, as it is considered that animals having the hair reversed on the shoulders would naturally be more erect than those with the reversal on the mid-back or rump.

Tree kangaroos are essentially tropical forest-loving marsupials, the two Australian species being restricted to the mountainous tableland region of north-eastern Queensland. In New Guinea, however, the numerous high mountain ranges and extensive river systems with their tropical forest zones have favoured the development of many confusingly varied and interrelated forms, with the result that no less than thirteen species have been described from the mainland of New Guinea, and two from adjacent islands.

During preparation of "The Wild Animals of Australasia"[1], published in 1926, it became evident that several of the species described by Paul Matschie were not clearly differentiated and with a view to clarifying the position every effort has since been made to acquire additional specimens, while during long vacation abroad in 1930 Troughton examined Matschie's types in Berlin, and those of *Dendrolagus matschiei* and *goodfellowi* housed respectively in the Rothschild Museum at Tring and the British Museum, with a view to furthering the work as material offered.

As a result of the close co-operation existing between the Taronga Park Trust and the Australian Museum an excellent topotypical series of *D. matschiei* was added to the Museum collection and has proved invaluable as a basis for comparison. Personal inquiries conducted by Le Souef further resulted in the acquisition of the skin of a hitherto undescribed species, obtained by the late Captain G. F. W. Zimmer between the Upper Awarra and Strickland Rivers. A second specimen, a semi-adult skin and skull, of this species was later obtained from the Bamu River district by the very helpful co-operation of Mr. A. J. Bates, on behalf of the Government Secretary of the Territory of Papua, and the Resident Magistrate at Daru in the Western Division.

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* Contribution from the Australian Museum.

[1] Le Souef and Burrell; Chiroptera by Troughton.

Two fine specimens of an undescribed species allied to *D. goodfellowi* were also received from the Taronga Park Trust at the end of 1933 from Mount Pratt, in the north-west of the Delta Division, doubtless through the co-operation of the Papuan authorities. The grateful acknowledgments of the authors are tendered to all who assisted in providing the material upon which the descriptions and comparisons are based, and to the authorities of overseas museums who facilitated the examination of collections.

Dendrolagus spadix sp. nov.

Diagnosis.—A uniformly dark reddish brown species relieved only by the slight golden or ochraceous buffy edging to the tail-base, small rump-spot, and irregular flecks on the tail. At once distinguished from *D. notatus* and *dorianus* by having the hair whorl in middle of back, and by differences in coloration. Habitat: Area between the Bamu, Upper Awarra, and Strickland Rivers, Western Division of Papua.

Colour.—General colour of back nearest dark chestnut (Ridgway's "Color Standards") tinged with mars brown, only the extreme base of the fur (barely 2 mm.) being light coloured, about ochraceous buff, the hairs thence shading from russet to dark chestnut brown. Snout not sharply contrasting with head, sparsely covered with short cinnamon to Prout's brown hairs which shade into the russet to rich mars brown of the forehead, ears, and nape. Ears with the almost evenly furred inner and outer sides uniformly mars brown, without any sign of light tipping. Undersurface a paler russet tone, slightly paler in the gular and inguinal regions, about ochraceous buff, but without trace of a sharply contrasting pale median area. Limbs without contrasted markings, the body coloration continuing on to the paws but warmed with a grizzling of ochraceous buff to tawny. There is an edging of tawny yellow at the inner angles of limbs and sides of tail-base. General colour of tail mars to chestnut-brown, with occasional irregular flecks of rich ochraceous-buff, and a similar light streak above the tail-base. Coloration of half grown animal entirely agreeing except for more youthful darker tone, most noticeable on the darker tail, which has similar light flecks of colour as in the adult.

General Characters.—Fur of adult male holotype unusually short, sparse, and somewhat harsh, suggestive of a rather lower habitat than usual for the genus; pelage of young animal naturally longer and richer but of similar texture. Single distinct whorl in middle of back. Rhinarium sparsely but evenly haired to a line above the nostrils. In the holotype flat-skin the tail slightly exceeds the length of the head and body. Ear rather short. Adult cranial features not available, but the skull of young animal with a basal length of 83.8 mm. shows no trace of the interorbital inflation characteristic of some species.

Dimensions of Holotype.—Flat skin of adult male much reduced by drying; head and body about 630; tail about 670; ear about 43 from inner base.

Typical Specimens.—Holotype skin of adult male, Austr. Mus., No. M.4561, collected by the late Captain G. F. W. Zimmer between the Upper Awarra and Strickland Rivers, Western Division of Papua, and presented by A. S. Le Souef; sub-adult skin and skull from the Bamu River district of the Western Division, Austr. Mus., No. M.5978, received through the Department of the Government Secretary of Papua.

Remarks.—In forwarding the adult skin, Captain Zimmer wrote: "I have just come back from a trip through entirely unknown and uninhabited country between the Upper Awarra and the Strickland Rivers, through which we had to cut our way on a compass course. One of my police shot what I take to be a tree climbing kangaroo, and, as it is entirely different to the animals shown in the Sydney Zoo as such, I have sent you the skin.

"It rained very hard for a number of days and the only means of drying it was over the fire. The skin was that of a large male, nearly six feet from nose to tip of tail *before being dried.* It was shot in a tree and, according to the boys, would live on the ground in fine weather and go into the trees when it rained, but one doesn't take much notice of that."

Dendrolagus deltae sp. nov.

Diagnosis.—Allied to *D. goodfellowi* by the marked inflation of the interorbital region, but apparently a smaller animal with a comparatively shorter tail, contrasted with a larger skull and dentition, greater interorbital inflation, and relatively longer nasals. Coloration generally similar, but the dorsal fur not definitely tri-coloured, and lacking light loin stripes, the muzzle paler than crown, and the ears light tipped. Distinguished from *D. matschiei* by the interorbital inflation, dimensions, and minor features of coloration. Habitat: Region of Mount Pratt, in the north-east of the Delta Division of Papua.

Colour.—Basal fur of back cinnamon-buff, shading imperceptibly into cinnamon, then into chestnut brown tips on the centre of back, the general colour much darker on the sides. A marked narrow dark spinal line extends from the forehead on to the base of the tail; not bordered by distinct loin stripes as in *goodfellowi.* Muzzle pale buffy, decidedly lighter than crown. Ears mainly dark russet brown, upper third of outer edge and tip light yellowish. Russet around neck and shoulders, this colour extending around throat and upper chest, separating the light gular and belly areas. Centre of chest and belly strongly contrasted with the mars-brown sides, the fur warm buff washed with ochraceous, becoming a much richer tawny around vent and base of tail. Dark body colour extending down front of limbs rather irregularly, to a point near the wrist, and to the heels. Manus of male shining warm buff, pes similar but washed with ochraceous tawny; manus of female darker warm buff tinged with ochraceous. Tail lighter than body, but darker than in *matschiei,* about shining or golden buckthorn brown, without the mottling described for *goodfellowi.*

External Characters.—Reversal of fur indicated by a definite double whorl in the male, the whorls less distinct and several inches lower in the female. Tail barely equal to the head and body length in the female, definitely shorter in the male, instead of being longer than the head and body as in *goodfellowi,* according to dimensions given for the type.

Skull and Dentition.—Skull and teeth proportionately larger than in *goodfellowi,* the greater breadth of the skull being emphasized by the zygomatic breadth of the allotype female being 8 mm. wider than that of the male holotype skull of *goodfellowi* which is of similar length; the greater interorbital inflation, and nasal length is similarly emphasized.

Dimensions of Holotype Male.—Fresh specimen: Head and body 660; tail 620; pes 122; ear 59 mm.

Skull dimensions: Holotype male, allotype in brackets; basal length 114.5 (110); greatest breadth 72.2 (74); nasals, length 46 (45.1); interorbital 29 (31.2); palatal length 69.5 (67.6); length, premolar 11.1 (10.1); length three anterior molars 21.5 (19.9) mm.

Typical Specimens.—Holotype male No. M.5418, and allotype female M.5420, in the Australian Museum collection, presented by the Trustees of Taronga Park Zoological Gardens, Sydney.

Habitat.—Both specimens from the region of Mount Pratt, in the north-eastern area of the Delta Division of Papua.

Remarks.—Analysis of the external and cranial dimensions leaves little doubt of the specific distinction of this tree kangaroo, which exhibits the generally brilliant and contrasted coloration of the *matschiei-goodfellowi* group. It is clearly distinguished from the former by the marked inflation of the interorbital region, and from the latter more nearly allied form by the various characteristics detailed above.

Dendrolagus matschiei matschiei Foerster and Rothschild.

Dendrolagus matschiei Foerster and Rothschild, Novitates Zoologicae, xiv., 1907, p. 506, pl. iv.

Dendrolagus matschiei flavidior Matschie, Sitz. Ges. Nat. Freunde, Berlin, 1912, p. 572. Id., *loc. cit.*, 1915, 4, p. 94.

It is evident from a comparison of typical material in the Berlin, Tring, and British Museums that individual descriptions are misleading in various respects, both as to a reasonable interpretation of colours and the extent of markings, and authors' habits of describing single specimens when series are available, thus failing to allow for range of variation in certain forms of the brilliantly coloured *matschiei* group. Regarding dimensions also, it is evident that the proportional value of measurements is lessened or becomes worthless owing to the undue stretching, or mounting, of the skins.

Comparison of the type of Matschie's yellowish race with the plate of *matschiei,* and the typical Tring Museum series, makes it clear that Matschie made no allowance when describing his unique specimen of *flavidior,* for the existence of variation in the colour marking, or the fact that the description and figure of *matschiei* represented a single individual. In addition to a slightly more yellowish tone generally, the differences consisted in having the hair whorls situated somewhat higher on the back, and in the extent or delimitation of various colour-markings, all of which features are found to be subject to much variation in a series.

In reference to habitat, Matschie appears to have regarded the Sattelberg range area as faunally distinct from the Rawlinson and Saruwaged Mountains area, although both localities are situated on the Huon Peninsula. This view was based largely upon the slight and variable distinction shown by the single specimen of the subspecies *flavidior,* but as the habitat may be regarded as practically coincident with that of the typical race, it would seem evident that Matschie's yellowish form should be merged with the typical *matschiei,* in the coloration of which bright browns and yellows predominate.

Dendrolagus matschiei burgersi Matschie.

Dendrolagus burgersi Matschie, Sitz. Ges. Nat. Freunde, Berlin, 1912, 10, p. 571.

In the specific description of this form Matschie compared it superficially with the geographically more distant *goodfellowi,* and thereby overlooked the obviously closer affinity in cranial and other features with the geographically intermediate *matschiei.* His action may have been partly due to the extreme brevity of Foerster and Rothschild's description of *matschiei,* and the fact that Thomas, when describing the marked interorbital inflation in *goodfellowi,* did not state whether a similar degree of inflation was present in *matschiei,* although the typical skull was apparently available for comparison.

A series of topotypical crania of *matschiei* in the Australian Museum exhibit no trace of marked inflation, while Matschie's description of *burgersi* stated that the forehead is flat, with hardly any arch. It appears beyond doubt therefore that the two forms are linked together, and differentiated from *goodfellowi* and *deltae,* by their lack of the marked interorbital inflation present in the two latter.

The much shorter tail was stressed by Matschie as a distinction from *goodfellowi,* in which the tail is shown as about three inches longer than the head and body in the type, but such dimensions taken from the skin are subject to distortion, apart from natural variation, and in any event the tail-length of *burgersi* accords with the range of tail-length of *matschiei,* in which it is equal to or shorter than the length of the head and body.

Coloration appears therefore to provide the main distinction and in this regard the only features of importance, beyond mere variation, appear to consist in *burgersi* having a somewhat darker face, and ears without light yellowish tips, and in the dorsal region having the light nape and loin stripes of *goodfellowi* which are lacking in *matschiei.*

In view of the above, it would seem that with the exception of the light ear-tips and stripes on the back, and some minor differences in cranial dimensions, such as the greater nasal width posteriorly, there are no features adequately supporting the specific distinction of *burgersi.* As the habitat of *burgersi,* however, is in the Hunstein Range in the mid Sepik Division, some three hundred miles north-west of the typical locality of *matschiei,* on the Huon Peninsula, subspecific distinction appears warranted.